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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
NORTHPOINT TECHNOLOGY	)	RM No. 9245
Petition for Rule Making To Modify Section 101.147(p) of the Commission's Rules To Authorize Subsidiary Terrestrial Use of the 12.2-12.7 GHz Band By Digital Broadcast Satellite Licensees and Their Affiliates	)	

OPPOSITION OF ECHOSTAR COMMUNICATIONS CORPORATION

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Dated: April 20, 1998

SUMMARY

EchoStar Communications Corporation ("EchoStar") hereby submits its Opposition to the Petition for Rulemaking filed by Northpoint Technology ("Northpoint") in the above captioned proceeding. Northpoint proposes to use bands currently allocated to the Direct Broadcast Satellite ("DBS") service, a service characterized by high power and ubiquitous receive antennas, to provide a complementary, equally ubiquitous terrestrial service on a secondary basis. EchoStar cannot support Northpoint's proposal for a rulemaking because Northpoint has not shown that its proposed service can operate without causing harmful interference into existing DBS services. Northpoint's preliminary analysis points to such serious threats to the integrity of DBS service – the only proven alternative to cable – that the Commission should not entertain the notion of a rulemaking about introducing another service in the same band, at least at this time.

In particular, the analysis offered by Northpoint rests on a grossly inaccurate premise – that DBS systems can live with a Carrier-to-Noise and Carrier-to-Interference of as little as 4.8 dB at the DBS receiver. EchoStar's systems require a minimum of Carrier-to-Interference ratio substantially greater than the number postulated by Northpoint. By Northpoint's own admission, its system would use up the DBS systems' rain fade margin – which is all-important for service integrity – based on power adjustment mechanisms of doubtful reliability. The Commission cannot afford to allow endangering of the DBS service in that fashion.

Northpoint's interference calculations also over-simplify the geometry of the interference environment. Essentially, Northpoint assumes that all satellite receivers are pointed in a "generally southerly" direction, and that all Northpoint receivers are pointed in a "generally

northerly" one. This assumption ignores the fact that, especially with the launch of additional DBS satellites, DBS dishes will be simultaneously directed to points across a very broad range of the geostationary arc. Multipath interference, not considered by Northpoint, would further exacerbate the interference situation.

Experimentation with an additional service in the DBS band would be especially inappropriate because nothing in the service contemplated by Northpoint appears to absolutely require use of that band, at least for testing and experimental purposes. Northpoint essentially wishes to complement DBS service by installation of an additional terrestrial antenna. This combination can be achieved by using any of the bands the Commission has already set aside for ubiquitous or high density terrestrial services, including the Local Multipoint Distribution Service ("LMDS") in the Ka-band and spectrum in the 38 GHz band. EchoStar also points out that Northpoint assumes that consumers would be receptive to such a combination of satellite dish and terrestrial antenna. Northpoint does not explain how this combination would be decisively superior in consumers' minds to the combination of satellite dishes and over-the-air broadcast antennas that is already widely available. Northpoint does not explain why its relatively more cumbersome two-antenna model would be any more successful. Northpoint's assumptions in that regard, untested as they are through the use of any other point-to-multipoint microwave band, do not warrant experimenting by opening up the DBS band to such applications. Northpoint can test its contemplated service of a DBS complement in any of the FS point-to-multipoint bands.

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To: The Commission

OPPOSITION OF ECHOSTAR COMMUNICATIONS CORPORATION

EchoStar Communications Corporation ("EchoStar") hereby submits its Opposition to the Petition for Rulemaking filed by Northpoint Technology ("Northpoint") in the above captioned proceeding.[1] Northpoint proposes to use bands currently allocated to the Direct Broadcast Satellite ("DBS") service, a service characterized by high power and ubiquitous receive antennas, to provide a complementary, equally ubiquitous terrestrial service on a secondary basis. EchoStar cannot support Northpoint's proposal for a rulemaking because Northpoint has not shown that its proposed service can operate without causing harmful

[1] Petition for Rulemaking, RM No. 9245 (filed March 6, 1998) ("Northpoint Petition").

interference into existing DBS services. Northpoint's preliminary analysis points to such serious threats to the integrity of DBS service – the only proven alternative to cable – that the Commission should not entertain the notion of a rulemaking about introducing another service in the same band, at least at this time.

Experimentation with an additional service in the DBS band would be especially inappropriate because nothing in the service contemplated by Northpoint appears to absolutely require use of that band. Northpoint essentially wishes to complement DBS service by installation of an additional terrestrial antenna. This combination can be achieved by using any of the bands the Commission has already set aside for ubiquitous or high density terrestrial services, including the Local Multipoint Distribution Service ("LMDS") in the Ka-band and spectrum in the 38 GHz band. EchoStar also points out that Northpoint assumes that consumers would be receptive to such a combination of satellite dish and terrestrial antenna. Northpoint does not explain how this combination would be decisively superior in consumers' minds to the combination of satellite dishes and over-the-air broadcast antennas that is already widely available. Northpoint's assumptions in that regard, untested as they are through the use of any other point-to-multipoint microwave band, do not warrant experimenting by opening up the DBS band to such applications. In any event, Northpoint can develop its contemplated service of a DBS complement in any of the FS point-to-multipoint bands.

I. INTRODUCTION AND BACKGROUND

Northpoint proposes to set up terrestrial transmitters at the north end of cities and towns and to transmit signals from these transmitters at the same frequencies used by DBS operators. Customers would use two dishes to receive both offerings – one pointed *south* (towards a DBS satellite in geostationary orbit above the equator) for DBS service, and another pointed *north* (towards Northpoint's terrestrial transmitter) for Northpoint's. Northpoint argues that, because southerly oriented DBS dishes cannot "see" its transmissions from northerly transmitter, those transmissions will not interfere with DBS service.

Unfortunately, the preliminary evidence raises serious questions about Northpoint's ability to operate on a non-interference basis with DBS systems. Northpoint has engaged in testing of its concept in at a rural location near Kingsville, Texas. As Paul Langer, EchoStar's Manager of RF Engineerings shows in the attached Technical Annex, even this limited preliminary testing contains flaws that cast doubt on Northpoint's conclusions. Moreover, there are indications that interference would be much worse in urban areas, where DBS customers would likely experience interference caused by building or other structural reflections of Northpoint's signals.

II. SHARING BETWEEN TERRESTRIAL AND FSS POINT TO MULTIPOINT SERVICES IS EXTRAORDINARILY DIFFICULT

Northpoint's is not the first proposal for band sharing between terrestrial and Fixed Satellite Service ("FSS") point to multipoint services. The Commission knows a great deal about the complexities of such sharing situations – even in bands where services have not yet been implemented. In light of this experience with high density satellite and terrestrial

services, the Commission should not venture into a rulemaking about superimposing a terrestrial point-to-multipoint service onto the most fully developed point-to-multipoint satellite service, with millions of dishes already deployed.

Indeed, the DBS service was born from the rejection of terrestrial/FSS point to multipoint co-frequency band sharing. In the early 1980s, the Commission considered policies and rules for the then-nascent DBS service.[2] At the time, the 12.2-12.7 GHz band was dedicated to terrestrial microwave Fixed Service ("FS"). The Commission entertained proposals to continue allocating the band to FS,[3] to designate the band for High Definition Television broadcasting,[4] and, most relevant here, to share the band between the Fixed Service and DBS.[5] As it considered these various proposals, the Commission came to the conclusion that "any sharing of frequencies in this band between DBS and the terrestrial services in a given geographic area will be difficult, if not impossible. . . ."[6]

> The compatibility of the various radio services to which spectrum has been allocated at 12 and 17 GHz has been the subject of much analysis and discussion. These studies and discussions indicate that problems of compatibility exist in both the 12 and 17 GHz bands. At 12 GHz, the fixed service transmitters can cause

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2 *See, e.g., Inquiry Into the Development of Regulatory Policy in Regard to Direct Broadcast Satellites for the Period Following the 1983 Regional Administrative Radio Conference*, Report and Order, 90 FCC 2d. 676 (1982) ("*1982 DBS Order*").

3 *See id.* at 705.

4 *See id.* at 704.

5 *See id.* at 695.

6 *See Inquiry Into the Development of Regulatory Policy in Regard to Direct Broadcast Satellites for the Period Following the 1983 Regional Administrative Radio Conference*, Notice of Proposed Policy Statement and Rulemaking, 86 FCC 2d. 719, 725 (1981) ("*1981 DBS Notice*").

> interference to the broadcasting-satellite service ground receivers. . . . Generally, the broadcasting-satellite service and the fixed service at 12 GHz cannot coexist within the same geographic area when operating on the same or adjacent frequencies, but they can coexist when operating on widely separated frequencies.[7]

Specifically noting that proposals for co-frequency band sharing would make "reception of DBS signals . . . impossible and that the financial impact on the DBS systems might be severe,"[8] the Commission adopted a plan under which FS systems were migrated to other bands.[9]

The passage of time has not made co-frequency band sharing between point to multipoint terrestrial microwave and satellite services any easier. In 1994, representatives of the terrestrial Local Multipoint Distribution Service ("LMDS") met with representatives of the FSS in order to attempt a Negotiated Rulemaking that would encompass co-frequency band sharing in the 27.5 – 29.5 GHz (or "Ka") band.[10] According to the Facilitator of those meetings,

> The Committee negotiated intensively over its eight-week chartered period, concluding at midnight of its last day in an attempt to agree on means for these two services to operate together on a co-frequency basis, sharing the 27.5 – 29.5 GHz frequency spectrum. The Committee or its informal groups met almost every day and most evenings, including weekends or holidays. . . . [I]t was able to take advantage of the available

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[7] *Id.*

[8] *See Regulatory Policy Regarding the Direct Broadcast Satellite Service*, Memorandum Opinion Order, 94 FCC 2d 741, 743 (1983) ("*1983 Reconsideration Order*").

[9] *See 1982 DBS Order* at 702; *National Association of Broadcasters v. FCC*, 740 F.2d 1190, 1209 (D.C. Cir. 1984).

[10] *See* Report of the LMDS/FSS 28 GHz Band Negotiated Rulemaking Committee, CC Docket No. 92-297 (filed Sept. 23, 1994) ("Negotiated Rulemaking Report").

> corporate expertise of more than 100 highly talented and motivated engineers, scientists, attorneys, managers and administrators. . . .[11]

Despite all of this effort, the Negotiated Rulemaking Committee was unable to reach an agreement that would allow co-frequency band sharing. As the Facilitator put it:

> Although some believe that pressing further with negotiations would have been fruitful, particularly projecting new but commercially unproven technology, it became clear during Committee discussions that **LMDS and FSS service uplinks will not be technically able at this time to reasonably share the same spectrum**.[12]

The Committee specifically noted that it "considered all proposed solutions presented to it by the participants; however none were deemed feasible by any combination of LMDS and FSS proponents."[13] The Commission confirmed the Negotiated Rulemaking Committee's finding.[14]

The Commission reached a similar conclusion in 1997 when it considered possible sharing between FSS and terrestrial Digital Electronic Message Service ("DEMS") systems in the 18.82-18.92 band.[15] The Commission emphasized that the point-to-multipoint

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[11] Letter from William A. Luther, Facilitator, Negotiated Rulemaking Group to Kathleen M.H. Wallman, Chief, Common Carrier Bureau (Sept. 23, 1994).

[12] *Id.* (emphasis in original).

[13] Negotiated Rulemaking Report at 85.

[14] *Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5 – 29.5 GHz Frequency Band, to Reallocate the 29.5 – 30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services and Suite 12 Group Petition for Pioneer's Preference*, Third Notice of Proposed Rulemaking and Supplemental Tentative Decision, 11 FCC Rcd. 53, 59 (1995).

[15] *See Amendment of the Commission's Rules to Relocate the Digital Electronic Message Service From the 18 GHz Band to the 24 GHz Band and to Allocate the 24 GHz Band for Fixed Service*, Order, 12 FCC Rcd. 3471 (1997).

nature of both services precluded co-frequency sharing, noting that, "[f]or example, the highly directional nature of fixed point-to-point operations allows individual point-to-point links to be coordinated with Government operations at much closer distances than is possible with point-to-multipoint operations."[16] The Commission then compared the DEMS proceeding with the Ka-band proceeding described above:

> As part of the 28GHz proceeding, a great deal of effort, over several years, was put into determining whether ubiquitous terrestrial services could share spectrum with ubiquitous terrestrial services. In the 28 GHz Order we concluded, based on the entire record before us, that co-frequency sharing between NGSO/FSS uplinks from ubiquitously deployed terminals (satellite services) and [LMDS] . . . with its ubiquitously deployed subscriber terminals, was not feasible. . . . Subsequent developments, such as the availability of equipment to provide point-to-multipoint service in [the 18 GHz band] have raised substantial questions concerning the feasibility of traditional coordination methods for DEMS and [FSS] in the 18 GHz band.[17]

Because of the impossibility of co-frequency sharing between two point to multipoint services in the 18 GHz band, the Commission moved the DEMS service to a higher frequency band.

The Commission is thus well aware of the history of difficulties in achieving co-frequency sharing between high density satellite and terrestrial services even in cases where neither service has yet been implemented. Given this history, the Commission should not entertain the notion of a rulemaking to introduce one more ubiquitous service in the same band used by the most widely deployed satellite terminals. Such a rulemaking is all the more inappropriate when one considers that there are many other frequency bands available to

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16 *Id.* at 3471.

17 *Id.* at 3471.

Northpoint that may prove to be more consistent with its business plan, including the Ka-band and the 38 GHz spectrum.

III. NORTHPOINT HAS NOT DEMONSTRATED THAT IT CAN SHARE WITH DBS

Northpoint has submitted analyses describing the results of co-frequency testing that took place on a large privately owned tract of land in a remote, rural area of south Texas.[18] To conduct these tests, Northpoint mounted a transmit antenna on a boom lift, and measured interference into DBS systems in various locations around the transmit antenna. Separately, Northpoint also appears to have measured received power levels at DBS antennas positioned at fixed increments.

Northpoint concludes from the Report that "the basic concept of the Northpoint technology, transmitting terrestrially on co-channel satellite frequencies, is viable as long as the terrestrial station is properly engineered."[19] Unfortunately, the Northpoint Report fails to demonstrate that such proper engineering is possible. As Paul Langer, EchoStar's Manager of RF Engineering, shows in the attached Technical Annex, serious flaws in the Northpoint Report call its conclusions into question. Thus, Northpoint cannot demonstrate that it will not interfere with DBS systems even in a controlled, rural environment. Further, the Northpoint Report does not even begin to address the increased risk of interference that would almost certainly be present in a real-world environment.

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[18] *See* Progress Report WA2XMY (filed Jan. 8, 1998). Northpoint has also filed a subsequent report dated March 19, 1998 (together with the January 8, 1998 Report, the "Northpoint Report"). The two Reports are hereinafter distinguished by their date of filing.

[19] Northpoint January 8, 1998 Report at 9; Northpoint Petition at 15.

A. The Results of Northpoint's Rural Experiment are Flawed

At the outset of its analysis, Northpoint grossly understates the Carrier Noise and Interference ratio that DBS providers can live with: "as long as a Carrier-to-Interference ratio of at least 4.8 dB was maintained between the satellite signal and the terrestrial signal . . . then there would be no perceptible interference into the DirecTV of EchoStar DBS systems."[20] EchoStar requires a Carrier-to-Noise plus Interference ratio substantially greater than that number to preserve the integrity of its service. At the ratio postulated by Northpoint, EchoStar's dishes may not be able even to acquire the satellite signals. Even if the dishes can acquire the signals, the bit error rate will not meet Digital Video Broadcasting ("DVB") requirements (EchoStar's set-top box is DVB compliant to the ETS 300 421 specification).

Rather than measuring the bit-error rate, Northpoint essentially used the video signals "breaking up" as the interference threshold. This type of standard does not leave room for margin to amplitude variations, does not take into account DVB requirements, and is not relevant for assessing interference into non-video applications. EchoStar estimates that a more acceptable Carrier-to-Interference level would be at least 20 dB (equal to the cross polarization isolation level of the Low Noise Block Down Converter with Integrated Feedhorn.[21]

Furthermore, the margins required by EchoStar vary widely depending on weather conditions. By its own admission, Northpoint would use up part of the vital rain fade margin required by EchoStar based on the use of power adjustment mechanisms of doubtful reliability.

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[20] Northpoint January 8, 1998 Report at 9.

[21] Nor did Northpoint take into account the pointing error of dishes installed by EchoStar's customers.

Furthermore, the Northpoint field interference test oversimplifies the geometry of the interference environment for that test. Northpoint used only operational DBS satellites of DirecTV and EchoStar as of the time of the test. This ignores the fact that DBS dishes could be simultaneously oriented to a multitude of points across the geostationary arc – not just a couple of orbital locations. Use of a 40° elevation angle in Northpoint's calculations, *see* Northpoint March 19, 1998 Report at Figure 1, disregards the fact that, depending on the geographic area, that angle can be as low as 10° for EchoStar's system.

Moreover, Northpoint's separate measurements of received power levels at the DBS antenna have been made at 15-degree increments as opposed to on the basis of a worst-case scenario.[22] This means that the antenna gain patterns employed in the calculations may be substantially more robust than in a worst-case scenario. EchoStar notes that, depending on the area of the country, the elevation angle at which DBS dishes have to receive EchoStar's transmissions vary very widely and continuously -- not at specified increments.

B. Northpoint Fails To Address How Its System Would Perform In a Real-World Environment

Even if none of the above flaws were present in Northpoint's Report, Northpoint's showing would still be inadequate to demonstrate that it can operate on a non-interference basis with DBS systems. By its own terms, the Report did not attempt to demonstrate the performance of Northpoint's system in a real-world environment. Unless and until Northpoint does so, it would be wholly premature to allow Northpoint to commence operation that would in all likelihood interfere with DBS systems.

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[22] *See* January 8, 1998 Report at Section 3.2.

EchoStar believes that the operation of Northpoint's system in an urban environment presents far greater interference problems than were present in Northpoint's rural tests. Northpoint itself understands that "building and other structural reflections . . . could possibly affect the outcome of the test" in an urban environment.[23] However, EchoStar believes that Northpoint has minimized the extent of the potential problem. The "multipathing" caused by the reflection of terrestrial transmissions off of buildings and other structures would almost certainly interfere with DBS systems because of the nature of DBS technology.

> DBS set top boxes do not typically include amplitude and phase equalizers in the demodulators. [In comparison, MMDS receivers typically *do* include such equalizers]. A DBS receiver is not expected to have multipath problems given the location of the transmitter. Therefore, DBS transmitters will have difficulty in maintaining demodulator lock and good audio/video in a multipath environment. . . . Thus, line of sight is a requirement for each [DBS] receiver location.[24]

This multipathing problem could be compounded by "foliage flutter" and rapid amplitude fluctuation due to wind.

The EchoStar system downlinks each signal in a 24 MHz band. Assuming that Northpoint will maximize usage of the DBS band, the use of only one 8 MHz signal does not accurately represent the interference environment. A more likely scenario is that two or three 8 MHz signals will be in the same bandwidth as the satellite 24 MHz downlink signal. This effectively raises the total interferer power level and therefore reduces the actual C/(N+I) level.

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23 Northpoint January 8, 1998 Report at 4.

24 Technical Annex at 3 (emphasis added).

Nor did Northpoint take into account the different encoding rates for different DBS video channels. As Mr. Langer states:

> The DBS data stream consists of multiple digital video streams. They are interleaved depending upon the encoding rate for each video source. Thus, equal encoding rates will create a composite stream of all channels with equal interleaving on average. On EchoStar, the encoding rates vary for each channel depending upon program content and other factors. Therefore, monitoring for interference on a particular channel will result in C/(N+I) levels *different from another channel on the same data stream due to differences in the encoding rates.*[25]

In sum, Mr. Langer's analysis points to serious threats to the integrity of DBS service from the co-frequency operation of a high-density terrestrial service. In light of such threats, EchoStar is opposed to a rulemaking about introducing such a terrestrial service in the band, at least at this time.

IV. CONCLUSION

For the foregoing reasons, the Commission should not at this time institute a rulemaking to introduce yet another high-density service in the DBS band.

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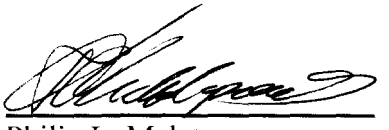
[25] Technical Annex at 2-3 (emphasis added).

Respectfully submitted,

EchoStar Communications Corporation

By: 

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Dated: April 20, 1998

CERTIFICATION OF PERSON RESPONSIBLE
FOR PREPARING ENGINEERING INFORMATION

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this pleading, that I have either prepared or reviewed the engineering information submitted in this pleading, and that it is complete and accurate to the best of my knowledge and belief.

Paul A. Langer 4/20/1998

Paul A. Langer
Manager of RF Engineering
EchoStar Communications Corporation
Product Division

Dated: April 20, 1998

CERTIFICATE OF SERVICE

I, Michael D. Nilsson, hereby declare that the foregoing pleading was sent this 20th day of April, 1998, by hand-delivery to the following:

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Michael D. Nilsson

April 20, 1998

RE: **Comments on DCE's Northpoint Experimental License Renewal to the FCC**

Diversified Communication Engineering, Inc. [DCE] has obtained an experimental FCC license to broadcast on the 12.2 GHz to 12.7 GHz frequency band from terrestrial sources. This is the same frequency that EchoStar uses for DBS transmissions from multiple satellite locations. DCE claims their system will not cause interference to current DBS customers. These tests were conducted in Kingsville, Texas in October 1997. An engineering report was completed and submitted to the FCC. Northpoint has now submitted a petition for rule making to allow terrestrial broadcast of DBS frequencies. Northpoint has also petitioned to extend their experimental license in order to begin testing in Austin, Texas.

Summary

The DCE Northpoint system will generate interference to existing DBS services. The tests demonstrated that interference can and do result in loss of signal for a DBS customer. This was reported in the Comsearch report for sites #3 and #8. The calculations and test results raise issues that indicate there will be problems with deployment of a terrestrial DBS broadcast system.

The test conditions for the experiments conducted last October 1997 are not representative of a fully deployed system. The test signals consisted of a singular narrow band interferer. The interferers were set to different frequencies for DirecTV and EchoStar receivers. This also indicates that the receivers were tuned to different polarities of the downlink signal thereby adding another variable to the tests. The antenna measurements used test conditions and adjustments that missed sidelobes and null points in the antenna gain patterns. The measurements were also conducted on a limited range of elevation adjustments. The antenna used was a DirecTV antenna and LNBF. The tests were not made with an EchoStar antenna and LNBF.

The determination of interference was subjective. The interferer was adjusted until the video just stopped 'breaking up'. If this level of C/(N+I) were maintained in an actual environment, there are several issues. First is the issue that the DBS receiver now has no margin to amplitude variations. The DBS system is designed as a noise limited system rather than an interference limited system. Multipath was not tested due to testing in a flat rural environment. The receiver depends upon the signal margins to compensate for signal degradation due to rain fade. Although DCE suggest that automatic power control may be used to compensate for rain fade, no link budgets were included in the reports to show a true analysis of system performance.

Analysis was performed only for satellite locations at 119W, 61.5W, and 101W. No calculations were included for satellite locations at 110W or 148W. These sites also require consideration.

Comments on Engineering Report by Delawder Communications, Inc, Exhibit EE, 3/19/1998:

- Assumption that 49 dBW is the minimum EIRP levels

A large number of EchoStar systems are customer installed. Pointing error can result in approximately one dB lower power given that the 3 dB beamwidth is approximately 3.5 degrees.

- Assumption that 6.0 dB C/I levels are acceptable degradation levels.

No specific details and/or calculations were furnished resulting in the 6.0 dB levels. This level will result in Bit Error Rates exceeding that required by DVB. Our set top box is DVB compliant to the ETS 300 421 specification.

- Section V. Conclusion states "... should not experience significant interference from the proposed experimental test facility at Austin."

This does not state that DCE will guarantee that no interference will be present. In addition, the term 'significant interference' is unclear as to what constitutes 'significant'.

- Figure 1: Horizontal Gain Pattern of Antenna

This table only calculates gain at a forty-degree elevation. The elevation requirement for EchoStar's 61.5° W.L. satellite across the USA varies from nearly 65 degrees in Miami Florida to a low of 10 degrees for Seattle Washington.

- Calculations for Various Satellite Locations

Interference calculations were presented for 119W EchoStar, 101W DirecTV, and 61.5W EchoStar. They were not calculated for 148W EchoStar. Furthermore, an additional satellite location at 110W was also not used in the calculations.

Comments on DCE's Progress Report to FCC dated January 8, 1998:

- FCC moved the testing location from Austin, Texas to Kingsville, Texas.

This site "was chosen to address FCC concerns that the test not interfere with existing DBS customers." Thus, the FCC already expressed a concern about deployment of the Northpoint system.

- "No interference calls were received during these tests."

It is unclear from the report how many DBS subscribers were actually within the affected areas that can experience interference.

- The report cites a DirecTV real world interference example where a terrestrial link passes the DirecTV headquarters at a 48 dBW EIRP. The DirecTV location is "12 degrees off center line to the beam peak" and "does not cause measurable degradation to the overall DBS link C/(N+I)."

It is unclear what the beamwidth of the terrestrial transmit antenna was for this case. In addition, the DirecTV antenna size was not stated. If the DirecTV antenna were a 46 cm and the interferer were 12 degrees off the 46cm main beam, the received signal would have been more than 20 dB lower than the satellite receive level. This scenario does not indicate whether the actual C/(N+I) is good or bad.

- The test method consisted of adjusting the interfering EIRP levels "until the DBS receiver was able to achieve a demodulation lock and a good, no freeze frame, video/audio signal." "... it was determined that the actual C/(N+I) required for demodulation lock and no visually noticeable degradation of the DBS signal was actually just under 5 dB."

The DBS data stream consists of multiple digital video streams. They are interleaved depending upon the encoding rate for each video source. Thus, equal encoding rates will create a composite stream of all channels with equal interleaving on average. On EchoStar, the encoding rates vary for each channel

depending upon program content and other factors. Therefore, monitoring for interference on a particular channel will result in C/(N+I) levels different from another channel on the same data stream due to differences in the encoding rates.

- Test conditions were a "very rural environment with almost flat terrain."

The test sites lacking buildings and other structures do not present the added problem of multipath issues. DCE does state that this needs to be tested "in a more urban environment to test for multi-pathing due to reflections." DBS set top box receivers do not typically include amplitude and phase equalizers in the demodulators. In comparison to an MMDS system, the MMDS receivers do include equalizers to compensate for multipathing problems. A DBS receiver is not expected to have multipath problems given the location of the transmitter. Therefore, DBS receivers will have difficulty in maintaining demodulator lock and good audio/video in a multipath environment. In addition, there are much more difficult problems such as 'foliage flutter' as the signal passes through leaves in a tree as it moves due to wind resulting in rapid amplitude fluctuations. Thus, line of sight is a requirement for each receiver location.

- The interfering test signals used with DirecTV and EchoStar were different in frequency.

The downlink frequencies for any DBS provider are defined and publicly available. There is no reason to test different receivers with different frequencies. The test placed an interferer at 12470 MHz for DirecTV and 12460 for EchoStar. These were "near mid-transponder". Given these frequencies it appears they were testing DirecTV set to receive a Left Hand Circular Polarized downlink which is actually centered at 12471.86 MHz. In comparison, the EchoStar receiver was set to receive a Right Hand Circular Polarized downlink, which is actually centered at 12457.28 MHz. Thus, the receivers were tested with differing polarities adding another variable in the comparison of interference levels.

- "Since the DBS modulation is TDMA, an interfering signal in any portion of the transponder will affect all channels on that transponder equally. Thus, if one channel experiences interference, all channels are similarly affected."

This is not true. See explanation above regarding interference and channel encoding rates.

- The terrestrial transmitter used by DCE was set to 8 MHz occupied bandwidth.

The EchoStar system downlinks each signal in a 24 MHz band. Assuming that DCE will maximize usage of the DBS band, the use of only one 8 MHz signal does not accurately represent the interference environment used for testing. A more likely scenario is that two or three 8 MHz signals will be in the same bandwidth as the satellite 24 MHz downlink signal. This effectively raises the total interferer power level and therefore reduces the actual C/(N+I) level. For that matter, DCE does not offer a system plan for spectrum usage.

- "This first stage of testing demonstrated that as long as a Carrier-to-Interference ratio of at least 4.8 dB was maintained between the satellite signal and the terrestrial signal ... there would be no perceptible interference into the DirecTV or EchoStar DBS systems."

The test conditions used are not likely to be present should a full system be deployed. In a fully defined system, it is not likely that the terrestrial signals are going to consist of a singular 8 MHz signal. The terrestrial signals will experience multipath and flutter problems. Finally, the tests did not take into account different encoding rates for different video channels. Refer to ETS 300 421 specification for link budget requirements.

- "Weather is obviously and justifiably a major concern to DBS operators ... one solution is to use an automatic power level control that monitors the RSL of the weakest usable DBS satellite and dynamically adjusts the terrestrial transmitter's output power accordingly."

There are no link budget calculations demonstrating that the terrestrial system will work under all weather conditions. Furthermore, there are no link calculations demonstrating that when the power level is lowered that the link can be maintained.

Comments on the Comsearch DBS Measurement Report dated October 28, 1997:

- The RCA antenna and LNBF was used for all tests.

Although DirecTV and EchoStar antenna and LNBF are similar products, there may exist fine differences that can affect this study. First, is the antenna gain pattern and sidelobe performance may be slightly different leading to inconsistencies. The second issue is the F/D ratio of the antenna and the LNBF feedhorn pattern. These also have particular gain patterns and sidelobe performance that can affect the results of the measurements.

- DBS Antenna Pattern Tests.

The RCA antenna was set up at two locations. At site #1, the antenna was fixed at 32 degrees elevation and rotated through 360 degrees of azimuth in 15-degree increments. At site #2, the RCA antenna was adjusted in elevation from 30 to 70 degrees in 5-degree increments.

The increments at each measurement are too large. The beam patterns on a 46-cm antenna has the 3-dB beamwidth at approximately 3.5 degrees. The 10-dB beamwidth is at approximately 5.9 degrees. The first null is approximately 3.7 degrees. Therefore, the pattern tests conducted miss the sidelobes and null points that will make significant difference. For example, the first sidelobe is as high as 17 dB from maximum gain and is approximately 5 degrees off center beam. As stated previously, the elevation of antennas across the USA can vary from 10 to 65 degrees. The tests were not conducted for the lower elevation angles between 10 and 30 degrees.

- At Site #3 and Site #8, interference was reported on the EchoStar system.

This is only noted that interference was observed and is a problem for DBS satellite receivers for DBS terrestrially broadcast signals.